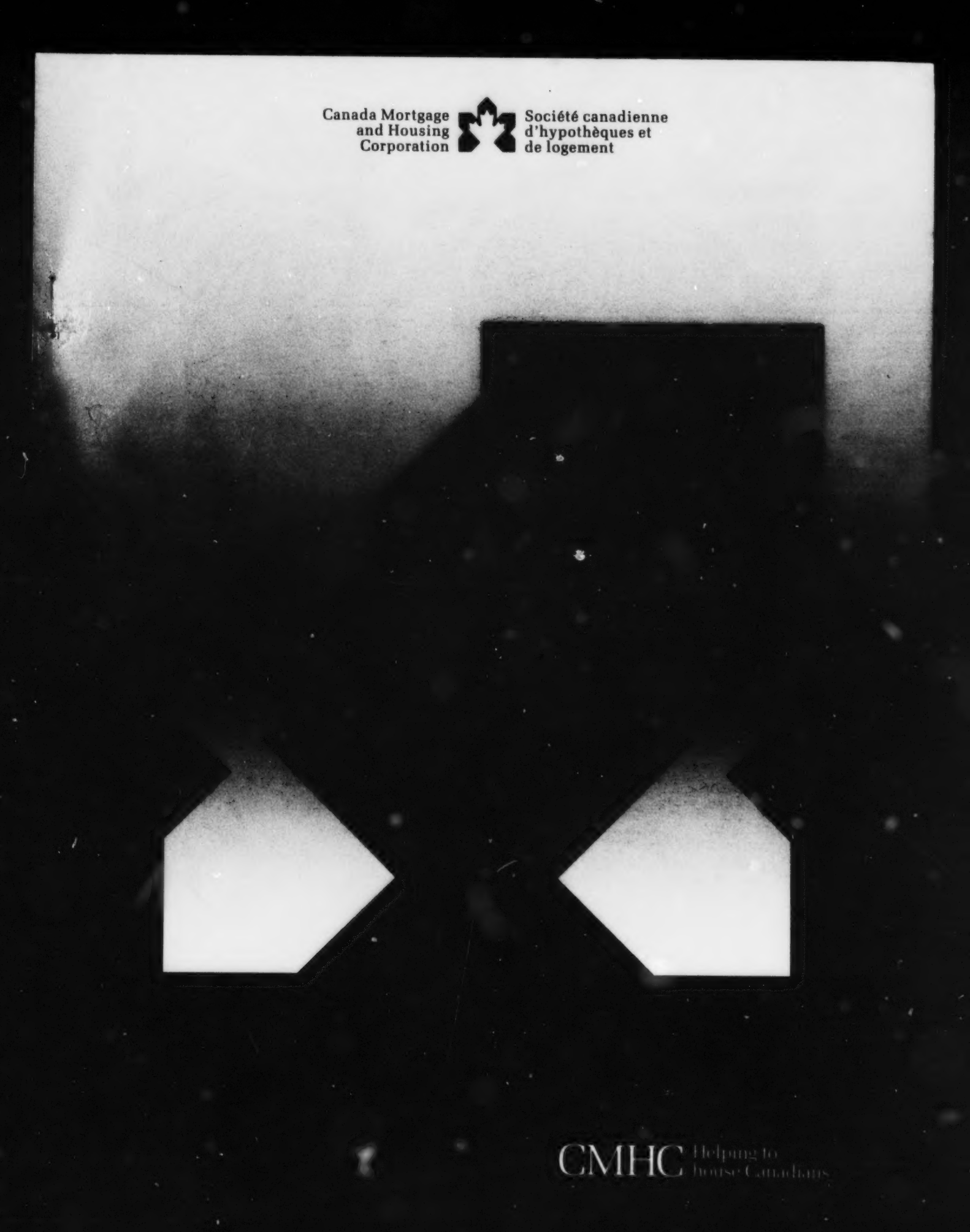
Canada Mortgage
and Housing
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de logement
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Helping to
house Canadians

A MANUAL FOR THE USE OF ETHOS

A Manual for the Use of

E T H O S

(Employment Through Home Ownership Stimulation)

a computer simulation program

prepared for

Canada Mortgage and Housing Corporation

by

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June 1988
revised October 1988

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1. Intended Uses of ETHOS

ETHOS is a model designed for simulating the effects of a particular set of government policy instruments on the short-run behaviour of the housing construction industry and the incremental employment thereby created.

The policy instruments are: (1) cash grants to purchasers of new homes; (2) interest-free loans to such purchasers; and (3) subsidization to reduce mortgage interest rates. In addition, the ETHOS user may experiment with timing aspects associated with the policy instruments.

A standard set of values has been provided for all parameters and exogenous variables of the system. The user has the option of changing any or all of these variables in order to use ETHOS to explore the impact of such policy initiatives as may be of interest.

A full description of the ETHOS model, including the derivation of all equations, is provided in the report on the ETHOS project. The formal description of the model involves the use of Greek symbols, underlining, overlining, superscripts and subscripts, and so on. In the computer program embodying ETHOS it is not possible to use such devices, but we have followed them as closely as possible in order to facilitate use of the model. In what follows the symbols appearing in the formal write-up of the model are juxtaposed with the symbols appearing in the computer program.

It is assumed that users of this manual and of the ETHOS program are familiar with the ETHOS model itself. However, for users of the model who wish to accept standard parameter values for all components other than the home ownership stimulation program itself, and to experiment with alternative aspects of the program implementation, a fuller description of the choice variables is provided in this manual (Section 2.3). It must be emphasised that well-informed experiments with ETHOS will require the user to be familiar with the model.

2. The Standard Set of Values for Parameters and Exogenous Variables

2.1 Starts, Stocks, and Vacancies

The model symbol $\bar{\alpha}$ appears in the computer program as "ALPHABAR." It appears in equations (1) through (3) of the ETHOS model.

The standard values are as follows:

ALPHABAR(1,3) = 0.012
ALPHABAR(1,4) = 0.50
ALPHABAR(2,4) = 0.10

The model symbol $\bar{\beta}$ appears in the computer program as "BETABAR." It is introduced in equation (4) of the ETHOS model.

The standard values are as follows:

BETABAR(1,0) = 0.9975
BETABAR(2,0) = 0.9975
BETABAR(1,1) = 0.57
BETABAR(1,2) = 0.43
BETABAR(1,3) = 0.00
BETABAR(2,1) = 0.20
BETABAR(2,2) = 0.80
BETABAR(2,3) = 0.00

The model symbol $\bar{S}/\bar{K}$ appears in the computer program as "SN/KN." It is introduced in connection with equations (4) and (5) of the ETHOS model.

The standard values are as follows:

SN/KN(1) = 0.0042
SN/KN(2) = 0.0048

The model symbol $\bar{\varphi}$ appears in the computer program as "PHIN." It is introduced in equation (10) of the ETHOS model.

The standard values are as follows:

PHIN(1) = 0.02
PHIN(2) = 0.04

The model symbol $\bar{S}$ appears in the computer program as "SN." It is introduced in equation (2) of the ETHOS model.

The standard values (in thousands of starts per quarter) are as follows:

SN(1) = 26.0
SN(2) = 19.0

2.2 Renter Income Distribution

The model symbol δ appears in the computer program as "DELTA." It is introduced in equation (11) of the ETHOS model.

The standard values are as follows:

DELTA0 = -29.391
DELTA1 = 2.9152

The model symbol ϵ appears in the computer program as "EPSILON." It is introduced in equation (15) of the ETHOS model.

The standard value is as follows:

EPSILON = 1.0

2.3 Characteristics of Government Program

ETHOS provides for the simulation analysis of the effects of three types of programs —

(1) cash grants to purchasers of new homes; the dollar amount of the cash grant to each such purchaser is a policy instrument, symbolized by c_1;

(2) interest-free loans to purchasers of new homes; the dollar amount of the loan to each such purchaser is a policy instrument, symbolized by c_2;

(3) subsidization to reduce mortgage interest rates; the amount by which the annual mortage rate of interest is reduced is a policy instrument, symbolized by ΔR.

The model symbols c_1, c_2, and ΔR appears in the computer program as "C1," "C2," and "DELR," respectively. C1 and C2 are introduced in equation (27) and DELR in equation (53) of the ETHOS model.

The standard values are as follows:

C1 = 3000
C2 = 0
DELR = 0

ETHOS automatically provides two sets of solutions -- a no-policy solution and a solution with the chosen policy in effect. The policy case could be with the standard values or it could be with whatever set of policy variables the user wishes to specify. The results of the policy and no-policy cases are compared in both tabular and graphical output.

Time-periods must be specified for policy instruments (2) and (3). The number of quarters that the interest rate subsidy applies is represented in the model by the symbol T', and appears in the computer program as T1; the number of quarters before the interest-free loan must be repaid is represented in the model by the symbol T", and appears in the computer program as T2.

The standard values are as follows:

T1 = 20
T2 = 20

Other policy-related timing variables relate to (1) the length of the amortization period for the mortgage, which is represented by the symbol T in the model and TL (expressed in quarters) in the computer program, (2) the quarter in which the policy is introduced, TSTART and the last quarter in which the policy is in effect, TEND.

The standard values are as follows:

TL = 100
TSTART = 9
TEND = 16

In defining the government program, ETHOS provides for the setting of a maximum house value, $\hat{w}$, for those eligible to benefit from the home ownership stimulation program. The symbol is introduced in equation (33) of the ETHOS model.

The symbol $\hat{w}$ is represented in the computer program by "WHAT".

The standard value is as follows:

WHAT = 150000

In addition, a parameter $\bar{Z}_0$ is provided to bring the income levels implied by the ETHOS program into accord with a reasonable independent estimate of the minimum income level required for a new house purchase in 1988 in the absence of a government program. (For convenience in model application, $\bar{Z}_0$ is defined so as to relate to a home purchase in 1988 rather than in 1982, the original base year referred to in the formal description of the model; the other calculations required to shift the base from 1982 to 1988 are performed within the computer program.)

The symbol $\bar{Z}_0$ is represented in the computer program by "ZLNO."

The standard value is as follows:

ZLNO = 25000

2.4 Participation in Program

The model symbol σ appears in the computer program as "SIGMA." It is introduced in equations (36) and (37) of the ETHOS model.

The standard values are as follows:

SIGMA1 = 0.9
SIGMA2 = 0.9

2.5 Value of Home and Financing of Home Purchase

The model symbol η appears in the computer program as "ETA." It is introduced in equation (24) of the ETHOS model.

The standard values for ETA are calculated as follows:

The user specifies a value of house and household income level for (1) a "low income" purchaser, and (2) a "high income" purchaser. ETHOS then calculates values for ETA0 and ETA1.

The standard values are as follows:

INCOME1 = 30000

HOUSE1 = 70000
INCOME2 = 60000
HOUSE2 = 115000

The model symbols ξ, λ_1, and λ_2 appear in the computer program as "XI," "LAMBDA1," and "LAMBDA2." They are introduced in equations (27) and (28) of the ETHOS model.

The standard values are as follows:

XI = 0.9
LAMBDA1 = 1.0
LAMBDA2 = 1.0

The model symbol $\hat{r}$ appears in the computer program as "RHAT." It is introduced in equation (32) of the ETHOS model.

The standard value is as follows:

RHAT = 0.30

2.6 Propensities to Purchase

The model symbols θ_1, θ_2, and $\bar{\zeta}$ appear in the computer program as THETA1, THETA2, and ZETABAR. They are introduced in equations (22) and (23) of the ETHOS model.

The standard values are as follows:

THETA1 = 1.0
THETA2 = 1.0
ZETABAR = 1.0

2.7 Interest and Discount Rates

The model symbol $\bar{R}$ which is introduced in equation (51) appears in the computer program as "RN". Future benefits and costs are discounted by individual households in the private sector at a rate R' and by the government sector at a rate R". The user determines whether these rates differ from R, the observed mortgage rate, by assigning values to the parameters DRP(=R'-R) and DRG(=R"-R).

The standard values, expressed as annual rates, are as follows:

RN = 0.09

DRP = 0.0
DRG = 0.0

2.8 Employment Creation

The model symbol π appears in the computer program as "PI." It is introduced in equations (40) and (41) of the ETHOS model.

The standard values, expressed for convenience in person-years, are as follows:

PI(1,1) = 0.80
PI(1,2) = 0.45
PI(1,3) = 1.13
PI(2,1) = 0.50
PI(2,2) = 0.45
PI(2,3) = 0.71

In the ETHOS program these values are multiplied by 4 to convert them into person quarters.

The model symbols $\bar{L}_0$ and $\bar{u}$ appear in the computer program as "LNO" and "UN." They are introduced in equations (43) and (50) of the ETHOS model.

The standard values are as follows:

LNO = 13.377
UN = 0.09

LNO is the estimated total natural labour force in 1988, in millions, and UN the corresponding natural rate of unemployment.

2.9 Natural Growth Rates

The model symbols for the long-term, natural rates of growth, $g(\bar{Y})$, $g(\bar{L})$, and $g(\bar{S})$ (or sometimes simply g) appear in the computer program as GY, GL, and GS. They are introduced at various places in the ETHOS model, including especially equations (44) through (46).

The standard values are as follows:

GS = 0.0
GL = 0.0
GY = 0.0

2.10 Period, Amplitude, and Displacement of Cycles

The model symbol p appears in the computer program as "PERIOD." It is introduced in equations (47) through (50) of the ETHOS model. The maximum permitted value is 50.

The standard value is as follows:

PERIOD = 25

The model symbol d appears in the computer program as "AMP"; the subscripts 1,2,3,4 appear in the computer program as Y,P,R,U. It is introduced in equations (47) through (50) of the ETHOS model.

The standard values are as follows:

AMP-Y = 0.03
AMP-P = 0.04
AMP-R = 0.02
AMP-U = 0.02

The model symbol ω appears in the computer program as "OMEGA." It is introduced in equations (47) through (50) of the ETHOS model.

The standard values are as follows:

OMEGA-Y = 0.0
OMEGA-P = 0.0
OMEGA-R = -6.25
OMEGA-U = 10.5

Note: OMEGA is the "displacement" parameter in the sine cycles. For convenience, the cycle in Y can be thought of as the "reference" cycle, and the timing of the other cycles expressed relative to it. Thus in the standard case the P-cycle coincides with the Y-cycle, while the cycle in R leads by 6.25 quarters and that in U lags by 10.5 quarters. (The one-quarter lead in R implies that its cycle coincides with that in the rate of inflation, as distinct from the cycle in P, the price level.)

Finally, the number of cycles, NCYCLE, over which the simulation is to be run may be chosen. The standard value is

NCYCLE = 2

The tabular printout will contain results relating to

NCYCLE * PERIOD quarters. However, the graphical output is limited to 100 quarters.

3. Getting Started

Before running ETHOS the user should ensure that a backup copy of the disk is available.

ETHOS can be run from drive A with standard values for all parameters and exogenous variables simply by entering

```
A> ETHOS
```

and responding "yes" when asked whether you wish to use the input file ETHOS.STD.

With this command you should obtain a copy of the standard output included with this manual as Appendix A and B; they will be on your disk in files called ETHOS.OUT and ETHOS.PLT.

4. Selecting Alternative Parameter Values

The values assigned to parameters and exogenous variables in ETHOS may be changed by modifying the input file. This is done by editing a copy of the input file ETHOS.STD (e.g., MY.IN might be the name assigned to the copy). The file may be edited with Wordstar, with WEDIT, or with any editor that the user finds convenient.

In editing the input file the user must take care to remain within the spaces allotted, and also to provide input of the type expected. Otherwise an error message will result when the program is run.

A copy of the standard input file follows:

```
PROGRAM:  STANDARD
ALPHABAR(1,3)        .012
ALPHABAR(1,4)        0.50     ALPHABAR(2,4)        0.10
BETABAR(1,0)        .9975     BETABAR(2,0)        .9975
BETABAR(1,1)         .57      BETABAR(2,1)         .20
BETABAR(1,2)         .43      BETABAR(2,2)         .80
BETABAR(1,3)         .00      BETABAR(2,3)         .00
PHIN(1)              .02      PHIN(2)              .04
PI(1,1)              .80      PI(2,1)              .50
PI(1,2)              .45      PI(2,2)              .45
PI(1,3)             1.13      PI(2,3)              .71
SN/KN(1)            .0042     SN/KN(2)            .0048
 LAMBDA1          1.0 LAMBDA2        1.0 DELTA0     -29.391 DELTA1        2.9152
 EPSILON          1.0 XI              .9 RHAT           .30 RN              .09
 DRP              0.0 DRG            0.0 DELR           .00 UN              .09
 C1            3000. C2              0. WHAT       150000. INCOME1      30000.
```

HOUSE1	70000.	INCOME2	60000.	HOUSE2	115000.	GY	.00						
GL	.00	GS	.00	ZETABAR	1.0	THETA1	1.0						
THETA2	1.0	SIGMA1	.9	SIGMA2	.9	LNO	13.377						
SN(1)	26.0	SN(2)	19.0	ZLNO	25000.	OMEGA-Y	0.0						
OMEGA-P	0.0	OMEGA-R	-6.25	OMEGA-U	10.5	AMP-Y	.03						
AMP-P	.04	AMP-R	.02	AMP-U	.02								
TL	100	TL1	20	TL2	20	TSTART	9						
TEND	16	PERIOD	25	NCYCLE	2	PSTART	1						
IOPT	1												
ITAB	1	2	3	4	5	6	7	8	9	10	11	12	13
IPLT	1	2	3	4	5	6	7	8	9				

Label -- "STANDARD" may be replaced with any combination of characters, to a maximum of 35 characters.

Parameter values --

-- parameter values are entered in either decimal or integer form, as indicated in the standard input file, above, and the user must follow this convention

-- a maximum of 10 character spaces is provided in which to enter parameter values; all characters must be numeric and include the decimal, where appropriate; the last character must not go beyond the column position indicated in the standard input file; integer values must be right justified

Output Selection --

-- the standard output selection of tables is provided in Appendix A and of graphs in Appendix B

-- the quarter in which printing starts is controlled by the parameter PSTART; the standard value is 1.

-- standard tabular output consists of ten tables; the tables are printed to an output file, the name of which is specified by the user; any table that is not wanted in a particular application need not be printed; printing to file is avoided by entering a 0 ("zero") in the position occupied by the table number on the input line ITAB

-- standard graphical output consists of six plots; the plots are printed to an output file, the name of which is specified by the user; any plots not wanted in a particular application need not be printed; printing to file is avoided by entering a 0 ("zero") in the position occupied by the plot number on the input line IPLT

Optional Output Selection --

-- an option is provided that constrains the total number of starts over the course of a cycle to equal the number in the absence of a government program; if this option is chosen (by setting the value of the parameter IOPT to 1), any starts induced as a result of policy actions are completely offset once the policy ends; the offset is assumed to be in proportion to the excess of starts over their long-run trend and to take place quarter by quarter only when starts are above trend; the user must ensure that the policy ends in time to allow such an offset to occur

-- the optional output selection of tables is provided in Appendix C and of graphs in Appendix D; only these tables and graphs are affected by the imposition of the constraint (the contents of Appendices A and B are unaffected)

-- to obtain any optional output the value on the input line IOPT must be 1

-- optional tabular output consists of three tables (Tables 11 - 13); these tables may be selected in addition to or instead of the standard tabular output; any table that is not wanted in a particular application need not be printed; printing to file is avoided by entering a 0 ("zero") in the position occupied by the table number on the input line ITAB; the optional output selection will be printed to the same output file as the standard output selection

-- optional graphical output consists of three plots (Plots 7, 8, and 9); these plots may be selected in addition to or instead of the standard graphical output; any plot not wanted in a particular application need not be printed; printing to a file is avoided by entering a 0 ("zero") in the position occupied by the plot number on the input line IPLT

5. Running ETHOS

Once all desired changes have been made in the input file, run ETHOS by entering

A> ETHOS

The user will be prompted by ETHOS for a file name for each of the input file, the tabular output and the plots. Any standard DOS response is acceptable --

e.g., MYTABLES.EX1 or simply MYTAB

e.g., MYPLOT.EX1 or simply MYPLT

6. Output from the ETHOS Model

Appendices A, B, C, and D provide a sample of the output from ETHOS; aside from the government program variables, all parameters and exogenous variables have been set at their standard levels, as described in section 2, above.

The government program variables have been set as follows:

C1 =	3000
C2 =	0
DELR =	0
T1 =	20
T2 =	20

Appendix A contains a summary of all parameter values used in the standard ETHOS run, and the full set of ten tables in which the results of the simulation experiment are presented. The notation corresponds closely to the symbols used in the presentation of the model. The only symbols not defined elsewhere are A and PY. "PY" denotes person years. "A" is used to denote accumulated values; for example "APY" indicates accumulated person years.

Appendix B contains six plots summarizing the times paths of selected variables. The only symbol not defined elsewhere is "phi*," which is used here to denote the vacancy rate in the absence of a government program.

Appendix C contains three tables that provide results after the optional adjustment that forces the starts of owner-type housing to be the same over the course of a full cycle whatever the policy initiative.

Appendix D contains three plots summarizing the time paths of selected variables after the optional adjustment.

7. Making Alternative Output Selections

Standard tabular output is presented in Appendix A and standard graphical output in Appendix B. The user may opt to obtain less output; the procedure is described in section 4, above.

8. Obtaining Printed Copy to Output

As described in section 4, all ETHOS output is automatically printed to files whose names are specified by the user. These files may then be printed to the screen and/or to the printer, as follows.

Assume that the user names the tabular output MYTAB and the plots MYPLT.

The files may then be inspected on the screen with the DOS commands

```
>TYPE MYTAB
>TYPE MYPLT
```

or on the printer with the DOS commands

```
>PRINT MYTAB
>PRINT MYPLT
```

9. Changing the ETHOS Model

ETHOS has been written in FORTRAN; specifically, it is written in Waterloo FORTRAN, WATFOR-77. If the program is to be recompiled, it would be simplest (and perhaps safest) to use a WATFOR compiler.

ETHOS has been written in such a way that modifications can be made fairly easily. However, the computer program has been designed in such a way as to permit flexibility in the features of government programs that one might simulate, as well as in assumptions regarding the key behavioural characteristics of home purchasers and renters and the nature of the macroeconomic environment in which a government program might be undertaken. Thus the user may find that there is no need to modify the computer program itself.

APPENDIX A

ETHOS. Program: STANDARD DATE: 1988-10-13

Parameters: INPUT

ALPHABAR(1,3)	= 0.0120				
ALPHABAR(1,4)	= 0.5000	ALPHABAR(2,4)	= 0.1000		
BETABAR(1,0)	= 0.9975	BETABAR(2,0)	= 0.9975		
BETABAR(1,1)	= 0.5700	BETABAR(2,1)	= 0.2000		
BETABAR(1,2)	= 0.4300	BETABAR(2,2)	= 0.8000		
BETABAR(1,3)	= 0.0000	BETABAR(2,3)	= 0.0000		
PHIN(1)	= 0.0200	PHIN(2)	= 0.0400		
PI(1,1)	= 0.8000	PI(2,1)	= 0.5000		
PI(1,2)	= 0.4500	PI(2,2)	= 0.4500		
PI(1,3)	= 1.1300	PI(2,3)	= 0.7100		
SN/KN(1)	= 0.0042	SN/KN(2)	= 0.0048		

LAMBDA1	= 1.0000	LAMBDA2	= 1.0000	DELTA0	= -29.3910
DELTA1	= 2.9152	EPSILON	= 1.0000	XI	= 0.9000
RHAT	= 0.3000	RN	= 0.0900	DRP	= 0.0000
DRG	= 0.0000	DELR	= 0.0000	UN	= 0.0900
C1	= 3000.0000	C2	= 0.0000	WHAT	=150000.0000
INCOME1	= 30000.0000	HOUSE1	= 70000.0000	INCOME2	= 60000.0000
HOUSE2	=115000.0000	GY	= 0.0000	GL	= 0.0000
GS	= 0.0000	ZETABAR	= 1.0000	THETA1	= 1.0000
THETA2	= 1.0000	SIGMA1	= 0.9000	SIGMA2	= 0.9000
LN0	= 13.3770	SN(1)	= 26.0000	SN(2)	= 19.0000
ZLN0	= 25000.0000	OMEGA-Y	= 0.0000	OMEGA-P	= 0.0000
OMEGA-R	= -6.2500	OMEGA-U	= 10.5000	AMP-Y	= 0.0300
AMP-P	= 0.0400	AMP-R	= 0.0200	AMP-U	= 0.0200
TL	= 100	TL1	= 20	TL2	= 20
TSTART	= 9	TEND	= 16	PERIOD	= 25
NCYCLE	= 2	PSTART	= 1	IOPT	= 1

Parameters: CALCULATED

ALPHA(1,3)	= 2.8000				
ALPHA(1,4)	= 0.5000	ALPHA(2,4)	= 0.1000		
ALPHA(1,5)	= 0.5000	ALPHA(2,5)	= 0.9000		
BETA(1,0)	= 0.9975	BETA(2,0)	= 0.9975		
BETA(1,1)	= 0.0024	BETA(2,1)	= 0.0010		
BETA(1,2)	= 0.0018	BETA(2,2)	= 0.0038		
BETA(1,3)	= 0.0000	BETA(2,3)	= 0.0000		
GAMMA(1,0)	= 1.0000	GAMMA(2,0)	= 1.0000		
GAMMA(1,1)	= 0.2100	GAMMA(2,1)	= 0.1200		

ETA0	= 25000.0000	ETA1	= 1.5000	ZETA	= 0.7308

Time Paths of Exogenous Input for First Cycle:

t	YLN	LN	SN1	SN2	YL/YLN	PRAT	R	USTAR
0	1.000	13.377	26.000	19.000	1.000	1.000	0.070	0.100
1	1.000	13.377	26.000	19.000	0.993	0.990	0.071	0.104
2	1.000	13.377	26.000	19.000	0.986	0.981	0.072	0.107
3	1.000	13.377	26.000	19.000	0.979	0.973	0.075	0.109
4	1.000	13.377	26.000	19.000	0.975	0.966	0.079	0.110
5	1.000	13.377	26.000	19.000	0.971	0.962	0.084	0.110
6	1.000	13.377	26.000	19.000	0.970	0.960	0.089	0.108
7	1.000	13.377	26.000	19.000	0.971	0.961	0.094	0.105
8	1.000	13.377	26.000	19.000	0.973	0.964	0.099	0.102
9	1.000	13.377	26.000	19.000	0.977	0.969	0.103	0.097
10	1.000	13.377	26.000	19.000	0.982	0.976	0.106	0.093
11	1.000	13.377	26.000	19.000	0.989	0.985	0.109	0.087
12	1.000	13.377	26.000	19.000	0.996	0.995	0.110	0.083
13	1.000	13.377	26.000	19.000	1.004	1.005	0.110	0.078
14	1.000	13.377	26.000	19.000	1.011	1.015	0.109	0.075
15	1.000	13.377	26.000	19.000	1.018	1.024	0.106	0.072
16	1.000	13.377	26.000	19.000	1.023	1.031	0.103	0.070
17	1.000	13.377	26.000	19.000	1.027	1.036	0.099	0.070
18	1.000	13.377	26.000	19.000	1.029	1.039	0.094	0.071
19	1.000	13.377	26.000	19.000	1.030	1.040	0.089	0.073
20	1.000	13.377	26.000	19.000	1.029	1.038	0.084	0.076
21	1.000	13.377	26.000	19.000	1.025	1.034	0.079	0.080
22	1.000	13.377	26.000	19.000	1.021	1.027	0.075	0.085
23	1.000	13.377	26.000	19.000	1.014	1.019	0.072	0.090
24	1.000	13.377	26.000	19.000	1.007	1.010	0.071	0.095
25	1.000	13.377	26.000	19.000	1.000	1.000	0.070	0.100

ETHOS Table 1: Selected Measures of State of Housing Sector (Percentages)
Program: STANDARD DATE: 1988-10-13

Quarter	Owner-type Housing				Renter-type Housing			
	s	s'	k	phi	s	s'	k	phi
1	19.5	21.1	0.07	1.98	-2.1	-15.4	0.00	4.07
2	19.6	19.8	0.15	1.98	-3.4	-14.5	-0.01	4.14
3	18.5	17.4	0.24	1.97	-4.3	-12.7	-0.02	4.19
4	16.3	14.0	0.31	1.98	-4.9	-10.2	-0.04	4.23
5	12.9	9.6	0.39	1.98	-5.1	-7.0	-0.06	4.26
6	8.6	4.2	0.45	2.00	-4.9	-3.1	-0.08	4.27
7	3.3	-1.9	0.49	2.01	-4.3	1.4	-0.10	4.26
8	-2.5	-8.4	0.51	2.04	-3.2	6.2	-0.13	4.23
9	2.9	8.4	0.51	2.06	-3.5	-6.2	-0.15	4.19
10	2.9	2.9	0.51	2.04	-3.4	-2.1	-0.16	4.20
11	0.7	-1.5	0.52	2.04	-2.9	1.1	-0.18	4.20
12	-1.8	-4.3	0.53	2.05	-2.3	3.2	-0.19	4.18
13	-3.5	-5.1	0.52	2.06	-1.7	3.8	-0.21	4.15
14	-3.7	-3.9	0.51	2.06	-1.3	2.9	-0.22	4.13
15	-2.2	-0.8	0.49	2.07	-1.1	0.5	-0.22	4.11
16	0.8	3.9	0.48	2.06	-1.3	-2.9	-0.23	4.10
17	-5.5	-11.8	0.48	2.05	-0.3	8.6	-0.23	4.11
18	-5.3	-5.2	0.46	2.07	0.1	3.8	-0.24	4.07
19	-2.0	1.2	0.44	2.07	0.0	-0.9	-0.24	4.05
20	2.5	7.1	0.42	2.06	-0.5	-5.2	-0.24	4.05
21	7.3	12.0	0.43	2.04	-1.3	-8.8	-0.24	4.07
22	11.6	16.0	0.45	2.02	-2.4	-11.7	-0.24	4.11
23	15.2	18.8	0.49	2.00	-3.5	-13.8	-0.25	4.16
24	17.9	20.6	0.54	1.99	-4.7	-15.1	-0.26	4.21
25	19.7	21.4	0.61	1.97	-5.8	-15.6	-0.28	4.26
26	20.4	21.1	0.69	1.96	-6.7	-15.4	-0.30	4.31
27	20.1	19.8	0.77	1.96	-7.5	-14.5	-0.33	4.35
28	18.8	17.4	0.86	1.96	-8.0	-12.7	-0.36	4.38
29	16.4	14.0	0.93	1.96	-8.2	-10.2	-0.39	4.41
30	13.0	9.6	1.01	1.97	-8.1	-7.0	-0.43	4.42
31	8.6	4.2	1.06	1.98	-7.6	-3.1	-0.47	4.42
32	3.3	-1.9	1.11	2.00	-6.7	1.4	-0.51	4.40
33	-2.5	-8.4	1.13	2.02	-5.4	6.2	-0.54	4.36
34	-8.7	-14.9	1.12	2.05	-3.8	10.9	-0.57	4.30
35	-14.7	-20.7	1.09	2.07	-1.9	15.1	-0.59	4.23
36	-19.9	-25.2	1.04	2.10	0.1	18.4	-0.61	4.15
37	-23.9	-27.9	0.96	2.12	2.2	20.4	-0.61	4.06
38	-26.2	-28.5	0.87	2.14	4.0	20.9	-0.61	3.98
39	-26.6	-26.9	0.76	2.15	5.6	19.7	-0.60	3.89
40	-24.9	-23.3	0.65	2.16	6.7	17.0	-0.57	3.82
41	-21.5	-18.1	0.54	2.15	7.4	13.2	-0.55	3.77
42	-16.7	-11.8	0.44	2.14	7.5	8.6	-0.51	3.74
43	-10.9	-5.2	0.36	2.12	7.1	3.8	-0.47	3.74
44	-4.8	1.2	0.30	2.10	6.3	-0.9	-0.44	3.75
45	1.1	7.1	0.27	2.07	5.2	-5.2	-0.40	3.79
46	6.6	12.0	0.26	2.05	3.8	-8.8	-0.37	3.83
47	11.3	16.0	0.28	2.03	2.2	-11.7	-0.35	3.89
48	15.1	18.8	0.32	2.01	0.6	-13.8	-0.33	3.96
49	17.8	20.6	0.38	1.99	-0.9	-15.1	-0.32	4.03
50	19.6	21.4	0.44	1.98	-2.4	-15.6	-0.32	4.10

ETHOS Table 2: Selected Measures of State of Housing Sector (Percentages)
Program: None DATE: 1988-10-13

Quarter	Owner-type Housing				Renter-type Housing			
	s	s'	k	phi	s	s'	k	phi
1	19.5	21.1	0.07	1.98	-2.1	-15.4	0.00	4.07
2	19.6	19.8	0.15	1.98	-3.4	-14.5	-0.01	4.14
3	18.5	17.4	0.24	1.97	-4.3	-12.7	-0.02	4.19
4	16.3	14.0	0.31	1.98	-4.9	-10.2	-0.04	4.23
5	12.9	9.6	0.39	1.98	-5.1	-7.0	-0.06	4.26
6	8.6	4.2	0.45	2.00	-4.9	-3.1	-0.08	4.27
7	3.3	-1.9	0.49	2.01	-4.3	1.4	-0.10	4.26
8	-2.5	-8.4	0.51	2.04	-3.2	6.2	-0.13	4.23
9	-8.7	-14.9	0.51	2.06	-1.8	10.9	-0.15	4.19
10	-14.7	-20.7	0.48	2.09	-0.1	15.1	-0.16	4.13
11	-19.9	-25.2	0.43	2.11	1.7	18.4	-0.17	4.06
12	-23.9	-27.9	0.36	2.14	3.6	20.4	-0.17	3.98
13	-26.2	-28.5	0.26	2.16	5.3	20.9	-0.15	3.89
14	-26.6	-26.9	0.15	2.17	6.8	19.7	-0.14	3.82
15	-24.9	-23.3	0.04	2.17	7.8	17.0	-0.11	3.76
16	-21.5	-18.1	-0.06	2.17	8.3	13.2	-0.07	3.71
17	-16.7	-11.8	-0.16	2.15	8.4	8.6	-0.04	3.69
18	-10.9	-5.2	-0.24	2.14	7.9	3.8	0.00	3.68
19	-4.8	1.2	-0.30	2.11	7.0	-0.9	0.04	3.70
20	1.1	7.1	-0.33	2.09	5.8	-5.2	0.08	3.74
21	6.6	12.0	-0.33	2.06	4.3	-8.8	0.11	3.79
22	11.3	16.0	-0.31	2.04	2.7	-11.7	0.14	3.85
23	15.1	18.8	-0.27	2.02	1.1	-13.8	0.16	3.92
24	17.8	20.6	-0.22	2.00	-0.5	-15.1	0.17	3.99
25	19.6	21.4	-0.15	1.99	-2.0	-15.6	0.17	4.06
26	20.4	21.1	-0.07	1.98	-3.4	-15.4	0.17	4.13
27	20.1	19.8	0.02	1.97	-4.5	-14.5	0.16	4.18
28	18.7	17.4	0.10	1.97	-5.3	-12.7	0.14	4.23
29	16.4	14.0	0.18	1.98	-5.8	-10.2	0.12	4.27
30	13.0	9.6	0.26	1.99	-5.9	-7.0	0.09	4.29
31	8.6	4.2	0.32	2.00	-5.6	-3.1	0.06	4.30
32	3.3	-1.9	0.36	2.02	-4.9	1.4	0.03	4.29
33	-2.5	-8.4	0.38	2.04	-3.8	6.2	0.01	4.26
34	-8.7	-14.9	0.38	2.06	-2.4	10.9	-0.02	4.21
35	-14.7	-20.7	0.36	2.09	-0.6	15.1	-0.03	4.15
36	-19.9	-25.2	0.30	2.12	1.3	18.4	-0.04	4.07
37	-23.9	-27.9	0.23	2.14	3.2	20.4	-0.04	3.99
38	-26.2	-28.5	0.13	2.16	5.0	20.9	-0.04	3.91
39	-26.6	-26.9	0.03	2.17	6.4	19.7	-0.02	3.83
40	-24.9	-23.3	-0.08	2.17	7.5	17.0	0.01	3.77
41	-21.5	-18.1	-0.19	2.17	8.1	13.2	0.04	3.72
42	-16.7	-11.8	-0.29	2.16	8.1	8.6	0.08	3.69
43	-10.9	-5.2	-0.36	2.14	7.7	3.8	0.11	3.69
44	-4.8	1.2	-0.42	2.11	6.8	-0.9	0.15	3.71
45	1.1	7.1	-0.45	2.09	5.6	-5.2	0.19	3.74
46	6.6	12.0	-0.45	2.06	4.2	-8.8	0.22	3.79
47	11.3	16.0	-0.44	2.04	2.6	-11.7	0.24	3.85
48	15.1	18.8	-0.40	2.02	1.0	-13.8	0.26	3.92
49	17.8	20.6	-0.34	2.00	-0.6	-15.1	0.27	3.99
50	19.6	21.4	-0.27	1.99	-2.1	-15.6	0.28	4.06

'ETHOS Table 3: Selected Measures of State of Housing Sector (Percentages)
Difference, Program Minus No Program DATE: 1988-10-13

Quarter	Owner-type Housing				Renter-type Housing			
	s	s'	k	phi	s	s'	k	phi
1	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
2	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
3	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
4	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
5	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
6	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
7	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
8	0.0	0.0	0.00	0.00	0.0	0.0	0.00	0.00
9	11.7	23.3	0.00	0.00	-1.7	-17.0	0.00	0.00
10	17.6	23.6	0.03	-0.05	-3.3	-17.2	0.00	0.07
11	20.7	23.7	0.09	-0.08	-4.7	-17.3	-0.01	0.14
12	22.1	23.6	0.17	-0.09	-5.9	-17.3	-0.03	0.20
13	22.8	23.4	0.26	-0.10	-7.0	-17.1	-0.05	0.26
14	22.9	23.0	0.36	-0.10	-8.0	-16.8	-0.08	0.31
15	22.7	22.5	0.45	-0.11	-8.9	-16.5	-0.12	0.35
16	22.4	22.0	0.55	-0.11	-9.6	-16.1	-0.15	0.39
17	11.2	0.0	0.64	-0.11	-8.6	0.0	-0.20	0.42
18	5.6	0.0	0.70	-0.06	-7.8	0.0	-0.24	0.38
19	2.8	0.0	0.74	-0.04	-7.0	0.0	-0.28	0.35
20	1.4	0.0	0.75	-0.03	-6.3	0.0	-0.32	0.31
21	0.7	0.0	0.76	-0.02	-5.7	0.0	-0.35	0.29
22	0.3	0.0	0.76	-0.02	-5.1	0.0	-0.38	0.26
23	0.2	0.0	0.76	-0.02	-4.6	0.0	-0.40	0.24
24	0.1	0.0	0.76	-0.02	-4.1	0.0	-0.43	0.22
25	0.0	0.0	0.76	-0.02	-3.7	0.0	-0.45	0.20
26	0.0	0.0	0.76	-0.02	-3.3	0.0	-0.47	0.18
27	0.0	0.0	0.75	-0.01	-3.0	0.0	-0.48	0.17
28	0.0	0.0	0.75	-0.01	-2.7	0.0	-0.50	0.15
29	0.0	0.0	0.75	-0.01	-2.4	0.0	-0.51	0.14
30	0.0	0.0	0.75	-0.01	-2.2	0.0	-0.52	0.13
31	0.0	0.0	0.75	-0.01	-2.0	0.0	-0.53	0.12
32	0.0	0.0	0.74	-0.01	-1.8	0.0	-0.54	0.11
33	0.0	0.0	0.74	-0.01	-1.6	0.0	-0.55	0.10
34	0.0	0.0	0.74	-0.02	-1.4	0.0	-0.56	0.09
35	0.0	0.0	0.74	-0.02	-1.3	0.0	-0.56	0.09
36	0.0	0.0	0.74	-0.02	-1.2	0.0	-0.57	0.08
37	0.0	0.0	0.74	-0.02	-1.0	0.0	-0.57	0.07
38	0.0	0.0	0.73	-0.02	-0.9	0.0	-0.58	0.07
39	0.0	0.0	0.73	-0.02	-0.8	0.0	-0.58	0.06
40	0.0	0.0	0.73	-0.02	-0.8	0.0	-0.58	0.06
41	0.0	0.0	0.73	-0.02	-0.7	0.0	-0.58	0.06
42	0.0	0.0	0.73	-0.02	-0.6	0.0	-0.59	0.05
43	0.0	0.0	0.72	-0.02	-0.6	0.0	-0.59	0.05
44	0.0	0.0	0.72	-0.02	-0.5	0.0	-0.59	0.05
45	0.0	0.0	0.72	-0.02	-0.5	0.0	-0.59	0.04
46	0.0	0.0	0.72	-0.01	-0.4	0.0	-0.59	0.04
47	0.0	0.0	0.72	-0.01	-0.4	0.0	-0.59	0.04
48	0.0	0.0	0.72	-0.01	-0.3	0.0	-0.59	0.04
49	0.0	0.0	0.71	-0.01	-0.3	0.0	-0.59	0.04
50	0.0	0.0	0.71	-0.01	-0.3	0.0	-0.59	0.04

ETHOS .Table 4: Number of Starts With and Without Program (thousands)
Program: STANDARD DATE: 1988-10-13

Quarter	Owner-type Housing				Renter-type Housing			
	S	S*	S-S*	A(S-S*)	S	S*	S-S*	A(S-S*)
1	31.1	31.1	0.0	0.0	18.6	18.6	0.0	0.0
2	31.1	31.1	0.0	0.0	18.4	18.4	0.0	0.0
3	30.8	30.8	0.0	0.0	18.2	18.2	0.0	0.0
4	30.2	30.2	0.0	0.0	18.1	18.1	0.0	0.0
5	29.4	29.4	0.0	0.0	18.0	18.0	0.0	0.0
6	28.2	28.2	0.0	0.0	18.1	18.1	0.0	0.0
7	26.9	26.9	0.0	0.0	18.2	18.2	0.0	0.0
8	25.3	25.3	0.0	0.0	18.4	18.4	0.0	0.0
9	26.8	23.7	3.0	3.0	18.3	18.7	-0.3	-0.3
10	26.8	22.2	4.6	7.6	18.4	19.0	-0.6	-0.9
11	26.2	20.8	5.4	13.0	18.4	19.3	-0.9	-1.8
12	25.5	19.8	5.8	18.7	18.6	19.7	-1.1	-3.0
13	25.1	19.2	5.9	24.7	18.7	20.0	-1.3	-4.3
14	25.0	19.1	6.0	30.6	18.8	20.3	-1.5	-5.8
15	25.4	19.5	5.9	36.5	18.8	20.5	-1.7	-7.5
16	26.2	20.4	5.8	42.3	18.8	20.6	-1.8	-9.3
17	24.6	21.7	2.9	45.2	18.9	20.6	-1.6	-11.0
18	24.6	23.2	1.5	46.7	19.0	20.5	-1.5	-12.4
19	25.5	24.7	0.7	47.4	19.0	20.3	-1.3	-13.8
20	26.7	26.3	0.4	47.8	18.9	20.1	-1.2	-15.0
21	27.9	27.7	0.2	48.0	18.7	19.8	-1.1	-16.0
22	29.0	28.9	0.1	48.0	18.6	19.5	-1.0	-17.0
23	30.0	29.9	0.0	48.1	18.3	19.2	-0.9	-17.9
24	30.7	30.6	0.0	48.1	18.1	18.9	-0.8	-18.7
25	31.1	31.1	0.0	48.1	17.9	18.6	-0.7	-19.4
26	31.3	31.3	0.0	48.1	17.7	18.4	-0.6	-20.0
27	31.2	31.2	0.0	48.1	17.6	18.1	-0.6	-20.6
28	30.9	30.9	0.0	48.1	17.5	18.0	-0.5	-21.1
29	30.3	30.3	0.0	48.1	17.4	17.9	-0.5	-21.5
30	29.4	29.4	0.0	48.1	17.5	17.9	-0.4	-22.0
31	28.2	28.2	0.0	48.1	17.6	17.9	-0.4	-22.3
32	26.9	26.9	0.0	48.1	17.7	18.1	-0.3	-22.7
33	25.3	25.3	0.0	48.1	18.0	18.3	-0.3	-23.0
34	23.7	23.7	0.0	48.1	18.3	18.6	-0.3	-23.2
35	22.2	22.2	0.0	48.1	18.6	18.9	-0.2	-23.5
36	20.8	20.8	0.0	48.1	19.0	19.2	-0.2	-23.7
37	19.8	19.8	0.0	48.1	19.4	19.6	-0.2	-23.9
38	19.2	19.2	0.0	48.1	19.8	19.9	-0.2	-24.1
39	19.1	19.1	0.0	48.1	20.1	20.2	-0.2	-24.3
40	19.5	19.5	0.0	48.1	20.3	20.4	-0.1	-24.4
41	20.4	20.4	0.0	48.1	20.4	20.5	-0.1	-24.5
42	21.7	21.7	0.0	48.1	20.4	20.5	-0.1	-24.6
43	23.2	23.2	0.0	48.1	20.4	20.5	-0.1	-24.8
44	24.7	24.7	0.0	48.1	20.2	20.3	-0.1	-24.8
45	26.3	26.3	0.0	48.1	20.0	20.1	-0.1	-24.9
46	27.7	27.7	0.0	48.1	19.7	19.8	-0.1	-25.0
47	28.9	28.9	0.0	48.1	19.4	19.5	-0.1	-25.1
48	29.9	29.9	0.0	48.1	19.1	19.2	-0.1	-25.1
49	30.6	30.6	0.0	48.1	18.8	18.9	-0.1	-25.2
50	31.1	31.1	0.0	48.1	18.5	18.6	-0.1	-25.2

ETHOS Table 5: Selected Measures of Participation and Program Cost
Program: STANDARD DATE: 1988-10-13

Quarter	Average Benefits ($)		Number of Participants (thousands)				Program Cost ($millions)	
	n1	n2	N1	N2	N	AN	C	AC
9	3000.	3000.	1.6	20.8	22.5	22.5	67.4	67.4
10	3000.	3000.	1.8	20.6	22.4	44.8	67.1	134.5
11	3000.	3000.	1.8	20.0	21.8	66.6	65.4	199.9
12	3000.	3000.	1.8	19.4	21.2	87.8	63.6	263.4
13	3000.	3000.	1.8	19.0	20.8	108.6	62.3	325.7
14	3000.	3000.	1.7	18.9	20.7	129.2	62.0	387.7
15	3000.	3000.	1.7	19.3	21.0	150.2	62.9	450.7
16	3000.	3000.	1.6	20.1	21.6	171.9	64.9	515.6

ETHOS Table 6: Employment Effects Associated with Program
Type of Effect: Direct
Program: STANDARD DATE: 1988-10-13

Quarter	Source of Employment Creation						Unemployment Rates (%)	
	Owner		Renter		Combined			
	delE	APY	delE	APY	delE	APY	u	u*
1	0.0	0.0	0.0	0.0	0.0	0.0	10.4	10.4
2	0.0	0.0	0.0	0.0	0.0	0.0	10.7	10.7
3	0.0	0.0	0.0	0.0	0.0	0.0	10.9	10.9
4	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
5	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
6	0.0	0.0	0.0	0.0	0.0	0.0	10.8	10.8
7	0.0	0.0	0.0	0.0	0.0	0.0	10.5	10.5
8	0.0	0.0	0.0	0.0	0.0	0.0	10.2	10.2
9	6.8	1.7	-0.5	-0.1	6.3	1.6	9.7	9.7
10	13.2	5.0	-1.1	-0.4	12.1	4.6	9.2	9.3
11	16.4	9.1	-1.6	-0.8	14.8	8.3	8.6	8.7
12	18.0	13.6	-2.1	-1.3	15.9	12.3	8.1	8.3
13	18.8	18.3	-2.5	-1.9	16.2	16.4	7.7	7.8
14	19.0	23.1	-2.9	-2.7	16.1	20.4	7.3	7.5
15	18.9	27.8	-3.3	-3.5	15.7	24.3	7.1	7.2
16	18.7	32.5	-3.6	-4.4	15.1	28.1	6.9	7.0
17	12.1	35.5	-3.4	-5.2	8.7	30.3	6.9	7.0
18	6.0	37.0	-3.0	-6.0	3.0	31.0	7.1	7.1
19	3.0	37.8	-2.7	-6.7	0.3	31.1	7.3	7.3
20	1.5	38.1	-2.5	-7.3	-1.0	30.8	7.6	7.6
21	0.8	38.3	-2.2	-7.9	-1.5	30.5	8.0	8.0
22	0.4	38.4	-2.0	-8.4	-1.6	30.1	8.5	8.5
23	0.2	38.5	-1.8	-8.8	-1.6	29.7	9.0	9.0
24	0.1	38.5	-1.6	-9.2	-1.5	29.3	9.5	9.5
25	0.0	38.5	-1.5	-9.6	-1.4	28.9	10.0	10.0
26	0.0	38.5	-1.3	-9.9	-1.3	28.6	10.4	10.4
27	0.0	38.5	-1.2	-10.2	-1.2	28.3	10.7	10.7
28	0.0	38.5	-1.1	-10.5	-1.1	28.0	10.9	10.9
29	0.0	38.5	-1.0	-10.7	-1.0	27.8	11.0	11.0
30	0.0	38.5	-0.9	-10.9	-0.9	27.6	11.0	11.0
31	0.0	38.5	-0.8	-11.1	-0.8	27.4	10.8	10.8
32	0.0	38.5	-0.7	-11.3	-0.7	27.2	10.5	10.5
33	0.0	38.5	-0.6	-11.4	-0.6	27.1	10.2	10.2
34	0.0	38.5	-0.6	-11.6	-0.6	26.9	9.7	9.7
35	0.0	38.5	-0.5	-11.7	-0.5	26.8	9.3	9.3
36	0.0	38.5	-0.5	-11.8	-0.5	26.7	8.8	8.7
37	0.0	38.5	-0.4	-11.9	-0.4	26.6	8.3	8.3
38	0.0	38.5	-0.4	-12.0	-0.4	26.5	7.8	7.8
39	0.0	38.5	-0.3	-12.1	-0.3	26.4	7.5	7.5
40	0.0	38.5	-0.3	-12.2	-0.3	26.3	7.2	7.2
41	0.0	38.5	-0.3	-12.2	-0.3	26.3	7.0	7.0
42	0.0	38.5	-0.2	-12.3	-0.2	26.2	7.0	7.0
43	0.0	38.5	-0.2	-12.4	-0.2	26.1	7.1	7.1
44	0.0	38.5	-0.2	-12.4	-0.2	26.1	7.3	7.3
45	0.0	38.5	-0.2	-12.5	-0.2	26.1	7.6	7.6
46	0.0	38.5	-0.2	-12.5	-0.2	26.0	8.0	8.0
47	0.0	38.5	-0.1	-12.5	-0.1	26.0	8.5	8.5
48	0.0	38.5	-0.1	-12.6	-0.1	25.9	9.0	9.0
49	0.0	38.5	-0.1	-12.6	-0.1	25.9	9.5	9.5
50	0.0	38.5	-0.1	-12.6	-0.1	25.9	10.0	10.0

'ETHOS· Table 7: Employment Effects Associated with Program
Type of Effect: Indirect
Program: STANDARD DATE: 1988-10-13

Quarter	Source of Employment Creation						Unemployment Rates (%)	
	Owner		Renter		Combined			
	delE	APY	delE	APY	delE	APY	u	u*
1	0.0	0.0	0.0	0.0	0.0	0.0	10.4	10.4
2	0.0	0.0	0.0	0.0	0.0	0.0	10.7	10.7
3	0.0	0.0	0.0	0.0	0.0	0.0	10.9	10.9
4	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
5	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
6	0.0	0.0	0.0	0.0	0.0	0.0	10.8	10.8
7	0.0	0.0	0.0	0.0	0.0	0.0	10.5	10.5
8	0.0	0.0	0.0	0.0	0.0	0.0	10.2	10.2
9	3.8	1.0	-0.4	-0.1	3.4	0.9	9.7	9.7
10	7.4	2.8	-1.0	-0.3	6.5	2.5	9.2	9.3
11	9.2	5.1	-1.4	-0.7	7.8	4.4	8.7	8.7
12	10.1	7.7	-1.9	-1.2	8.3	6.5	8.2	8.3
13	10.6	10.3	-2.3	-1.7	8.3	8.5	7.8	7.8
14	10.7	13.0	-2.6	-2.4	8.1	10.6	7.4	7.5
15	10.7	15.6	-2.9	-3.1	7.7	12.5	7.1	7.2
16	10.5	18.3	-3.2	-3.9	7.3	14.3	7.0	7.0
17	6.8	20.0	-3.0	-4.7	3.8	15.3	7.0	7.0
18	3.4	20.8	-2.7	-5.4	0.7	15.4	7.1	7.1
19	1.7	21.2	-2.5	-6.0	-0.8	15.2	7.3	7.3
20	0.9	21.4	-2.2	-6.6	-1.4	14.9	7.6	7.6
21	0.4	21.6	-2.0	-7.1	-1.6	14.5	8.0	8.0
22	0.2	21.6	-1.8	-7.5	-1.6	14.1	8.5	8.5
23	0.1	21.6	-1.6	-7.9	-1.5	13.7	9.0	9.0
24	0.1	21.6	-1.5	-8.3	-1.4	13.4	9.5	9.5
25	0.0	21.7	-1.3	-8.6	-1.3	13.0	10.0	10.0
26	0.0	21.7	-1.2	-8.9	-1.2	12.7	10.4	10.4
27	0.0	21.7	-1.1	-9.2	-1.1	12.5	10.7	10.7
28	0.0	21.7	-1.0	-9.4	-1.0	12.2	10.9	10.9
29	0.0	21.7	-0.9	-9.6	-0.9	12.0	11.0	11.0
30	0.0	21.7	-0.8	-9.8	-0.8	11.8	11.0	11.0
31	0.0	21.7	-0.7	-10.0	-0.7	11.7	10.8	10.8
32	0.0	21.7	-0.6	-10.2	-0.6	11.5	10.5	10.5
33	0.0	21.7	-0.6	-10.3	-0.6	11.4	10.2	10.2
34	0.0	21.7	-0.5	-10.4	-0.5	11.2	9.7	9.7
35	0.0	21.7	-0.5	-10.5	-0.5	11.1	9.3	9.3
36	0.0	21.7	-0.4	-10.6	-0.4	11.0	8.8	8.7
37	0.0	21.7	-0.4	-10.7	-0.4	10.9	8.3	8.3
38	0.0	21.7	-0.3	-10.8	-0.3	10.8	7.8	7.8
39	0.0	21.7	-0.3	-10.9	-0.3	10.8	7.5	7.5
40	0.0	21.7	-0.3	-11.0	-0.3	10.7	7.2	7.2
41	0.0	21.7	-0.2	-11.0	-0.2	10.6	7.0	7.0
42	0.0	21.7	-0.2	-11.1	-0.2	10.6	7.0	7.0
43	0.0	21.7	-0.2	-11.1	-0.2	10.5	7.1	7.1
44	0.0	21.7	-0.2	-11.2	-0.2	10.5	7.3	7.3
45	0.0	21.7	-0.2	-11.2	-0.2	10.5	7.6	7.6
46	0.0	21.7	-0.1	-11.2	-0.1	10.4	8.0	8.0
47	0.0	21.7	-0.1	-11.3	-0.1	10.4	8.5	8.5
48	0.0	21.7	-0.1	-11.3	-0.1	10.4	9.0	9.0
49	0.0	21.7	-0.1	-11.3	-0.1	10.3	9.5	9.5
50	0.0	21.7	-0.1	-11.4	-0.1	10.3	10.0	10.0

ETHOS Table 8: Employment Effects Associated with Program
Type of Effect: Induced
Program: STANDARD DATE: 1988-10-13

Quarter	Source of Employment Creation						Unemployment Rates (%)	
	Owner		Renter		Combined			
	delE	APY	delE	APY	delE	APY	u	u*
1	0.0	0.0	0.0	0.0	0.0	0.0	10.4	10.4
2	0.0	0.0	0.0	0.0	0.0	0.0	10.7	10.7
3	0.0	0.0	0.0	0.0	0.0	0.0	10.9	10.9
4	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
5	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
6	0.0	0.0	0.0	0.0	0.0	0.0	10.8	10.8
7	0.0	0.0	0.0	0.0	0.0	0.0	10.5	10.5
8	0.0	0.0	0.0	0.0	0.0	0.0	10.2	10.2
9	9.6	2.4	-0.6	-0.2	8.9	2.2	9.7	9.7
10	18.6	7.0	-1.5	-0.5	17.1	6.5	9.1	9.3
11	23.2	12.8	-2.3	-1.1	20.9	11.7	8.6	8.7
12	25.5	19.2	-3.0	-1.9	22.5	17.4	8.1	8.3
13	26.5	25.8	-3.6	-2.8	22.9	23.1	7.7	7.8
14	26.9	32.6	-4.2	-3.8	22.7	28.8	7.3	7.5
15	26.8	39.3	-4.6	-5.0	22.1	34.3	7.0	7.2
16	26.4	45.9	-5.1	-6.2	21.3	39.6	6.9	7.0
17	17.1	50.1	-4.8	-7.4	12.3	42.7	6.9	7.0
18	8.5	52.3	-4.3	-8.5	4.2	43.7	7.1	7.1
19	4.3	53.3	-3.9	-9.5	0.4	43.8	7.3	7.3
20	2.1	53.9	-3.5	-10.4	-1.4	43.5	7.6	7.6
21	1.1	54.1	-3.2	-11.2	-2.1	43.0	8.1	8.0
22	0.5	54.3	-2.8	-11.9	-2.3	42.4	8.5	8.5
23	0.3	54.3	-2.6	-12.5	-2.3	41.8	9.0	9.0
24	0.1	54.4	-2.3	-13.1	-2.2	41.3	9.5	9.5
25	0.1	54.4	-2.1	-13.6	-2.0	40.8	10.0	10.0
26	0.0	54.4	-1.9	-14.1	-1.8	40.3	10.4	10.4
27	0.0	54.4	-1.7	-14.5	-1.7	39.9	10.7	10.7
28	0.0	54.4	-1.5	-14.9	-1.5	39.5	10.9	10.9
29	0.0	54.4	-1.4	-15.2	-1.4	39.2	11.0	11.0
30	0.0	54.4	-1.2	-15.5	-1.2	38.9	11.0	11.0
31	0.0	54.4	-1.1	-15.8	-1.1	38.6	10.8	10.8
32	0.0	54.4	-1.0	-16.0	-1.0	38.4	10.5	10.5
33	0.0	54.4	-0.9	-16.2	-0.9	38.1	10.2	10.2
34	0.0	54.4	-0.8	-16.4	-0.8	37.9	9.7	9.7
35	0.0	54.4	-0.7	-16.6	-0.7	37.8	9.3	9.3
36	0.0	54.4	-0.6	-16.8	-0.6	37.6	8.8	8.7
37	0.0	54.4	-0.6	-16.9	-0.6	37.5	8.3	8.3
38	0.0	54.4	-0.5	-17.1	-0.5	37.3	7.8	7.8
39	0.0	54.4	-0.5	-17.2	-0.5	37.2	7.5	7.5
40	0.0	54.4	-0.4	-17.3	-0.4	37.1	7.2	7.2
41	0.0	54.4	-0.4	-17.4	-0.4	37.0	7.0	7.0
42	0.0	54.4	-0.3	-17.5	-0.3	36.9	7.0	7.0
43	0.0	54.4	-0.3	-17.6	-0.3	36.8	7.1	7.1
44	0.0	54.4	-0.3	-17.6	-0.3	36.8	7.3	7.3
45	0.0	54.4	-0.3	-17.7	-0.3	36.7	7.6	7.6
46	0.0	54.4	-0.2	-17.7	-0.2	36.7	8.0	8.0
47	0.0	54.4	-0.2	-17.8	-0.2	36.6	8.5	8.5
48	0.0	54.4	-0.2	-17.8	-0.2	36.6	9.0	9.0
49	0.0	54.4	-0.2	-17.9	-0.2	36.5	9.5	9.5
50	0.0	54.4	-0.1	-17.9	-0.1	36.5	10.0	10.0

ETHOS Table 9: Employment Effects Associated with Program
Type of Effect: Total
Program: STANDARD DATE: 1988-10-13

Quarter	Source of Employment Creation						Unemployment Rates (%)	
	Owner		Renter		Combined			
	delE	APY	delE	APY	delE	APY	u	u*
1	0.0	0.0	0.0	0.0	0.0	0.0	10.4	10.4
2	0.0	0.0	0.0	0.0	0.0	0.0	10.7	10.7
3	0.0	0.0	0.0	0.0	0.0	0.0	10.9	10.9
4	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
5	0.0	0.0	0.0	0.0	0.0	0.0	11.0	11.0
6	0.0	0.0	0.0	0.0	0.0	0.0	10.8	10.8
7	0.0	0.0	0.0	0.0	0.0	0.0	10.5	10.5
8	0.0	0.0	0.0	0.0	0.0	0.0	10.2	10.2
9	20.2	5.0	-1.5	-0.4	18.7	4.7	9.6	9.7
10	39.2	14.8	-3.5	-1.3	35.7	13.6	9.0	9.3
11	48.9	27.1	-5.3	-2.6	43.5	24.5	8.4	8.7
12	53.7	40.5	-7.0	-4.3	46.7	36.1	7.9	8.3
13	55.9	54.4	-8.5	-6.5	47.4	48.0	7.5	7.8
14	56.6	68.6	-9.7	-8.9	46.8	59.7	7.1	7.5
15	56.4	82.7	-10.9	-11.6	45.5	71.1	6.9	7.2
16	55.6	96.6	-11.8	-14.6	43.8	82.0	6.7	7.0
17	36.0	105.6	-11.2	-17.4	24.7	88.2	6.8	7.0
18	18.0	110.1	-10.1	-19.9	7.9	90.2	7.0	7.1
19	9.0	112.3	-9.1	-22.2	-0.1	90.1	7.3	7.3
20	4.5	113.4	-8.2	-24.2	-3.7	89.2	7.7	7.6
21	2.2	114.0	-7.4	-26.1	-5.1	87.9	8.1	8.0
22	1.1	114.3	-6.6	-27.7	-5.5	86.6	8.5	8.5
23	0.6	114.4	-6.0	-29.2	-5.4	85.2	9.0	9.0
24	0.3	114.5	-5.4	-30.6	-5.1	83.9	9.5	9.5
25	0.1	114.5	-4.8	-31.8	-4.7	82.7	10.0	10.0
26	0.1	114.5	-4.4	-32.9	-4.3	81.7	10.4	10.4
27	0.0	114.6	-3.9	-33.8	-3.9	80.7	10.7	10.7
28	0.0	114.6	-3.5	-34.7	-3.5	79.8	10.9	10.9
29	0.0	114.6	-3.2	-35.5	-3.2	79.0	11.0	11.0
30	0.0	114.6	-2.9	-36.2	-2.9	78.3	11.0	11.0
31	0.0	114.6	-2.6	-36.9	-2.6	77.7	10.8	10.8
32	0.0	114.6	-2.3	-37.5	-2.3	77.1	10.6	10.5
33	0.0	114.6	-2.1	-38.0	-2.1	76.6	10.2	10.2
34	0.0	114.6	-1.9	-38.5	-1.9	76.1	9.8	9.7
35	0.0	114.6	-1.7	-38.9	-1.7	75.7	9.3	9.3
36	0.0	114.6	-1.5	-39.3	-1.5	75.3	8.8	8.7
37	0.0	114.6	-1.4	-39.6	-1.4	75.0	8.3	8.3
38	0.0	114.6	-1.2	-39.9	-1.2	74.7	7.8	7.8
39	0.0	114.6	-1.1	-40.2	-1.1	74.4	7.5	7.5
40	0.0	114.6	-1.0	-40.4	-1.0	74.1	7.2	7.2
41	0.0	114.6	-0.9	-40.7	-0.9	73.9	7.0	7.0
42	0.0	114.6	-0.8	-40.9	-0.8	73.7	7.0	7.0
43	0.0	114.6	-0.7	-41.0	-0.7	73.5	7.1	7.1
44	0.0	114.6	-0.7	-41.2	-0.7	73.4	7.3	7.3
45	0.0	114.6	-0.6	-41.3	-0.6	73.2	7.6	7.6
46	0.0	114.6	-0.5	-41.5	-0.5	73.1	8.0	8.0
47	0.0	114.6	-0.5	-41.6	-0.5	73.0	8.5	8.5
48	0.0	114.6	-0.4	-41.7	-0.4	72.9	9.0	9.0
49	0.0	114.6	-0.4	-41.8	-0.4	72.8	9.5	9.5
50	0.0	114.6	-0.3	-41.9	-0.3	72.7	10.0	10.0

ETHOS Table 10: Summary Calculations
Program: STANDARD DATE: 1988-10-13

Program Cost (by end of program, $millions)

AC = 515.6

Additional Housing Starts Generated by Program
(by end of simulation period, thousands)

Owner-type starts, A(S-S*) = 48.1

Renter-type starts, A(S-S*) = -25.2

Net starts, A(S-S*) = 22.9

Program Participants (by end of program, thousands)

AN = 171.9

Employment created by Program (by end of simulation period, person-years)

Owner-type starts, APY = 114.6

Renter-type starts, APY = -41.9

Combined, APY = 72.7

Cost per Additional Housing Start (by end of simulation period, $)

Owner-type starts, AC/A(S-S*) = 10711.

Net starts, AC/A(S-S*) = 22528.

Cost per Person-Year of Employment Created (by end of simulation period, $)

Owner-type starts, AC/APY = 4500.

Combined, AC/APY = 7094.

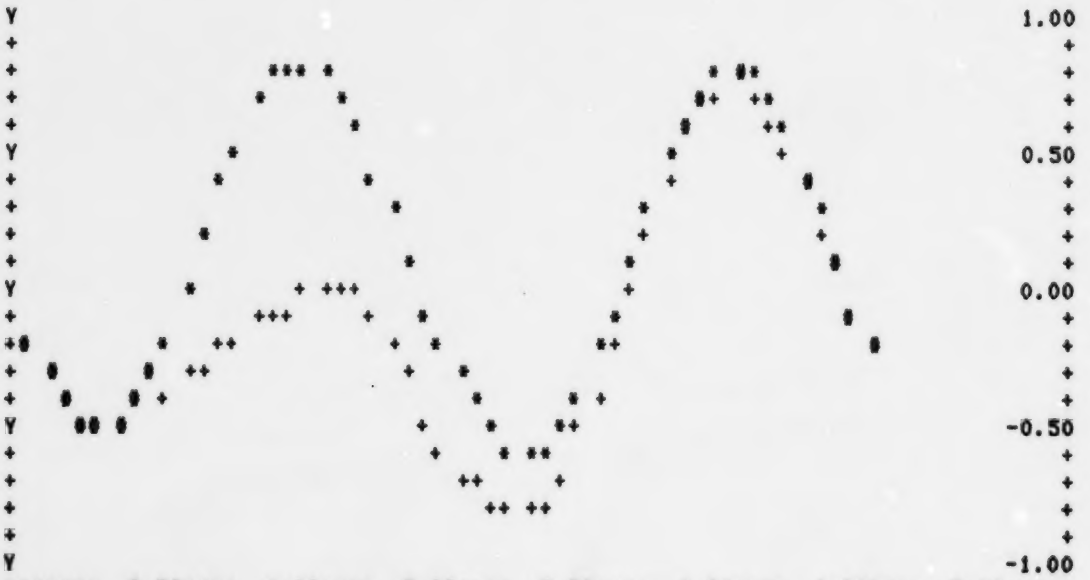
APPENDIX B

ETHOS Plot 1: Housing Starts (as proportionate difference from natural level)
Legend: s = + s* = * coincident = #

Owner-type Housing

0.100E+01<= X <= 0.500E+02 vs -0.266E+00<= Y <= 0.204E+00

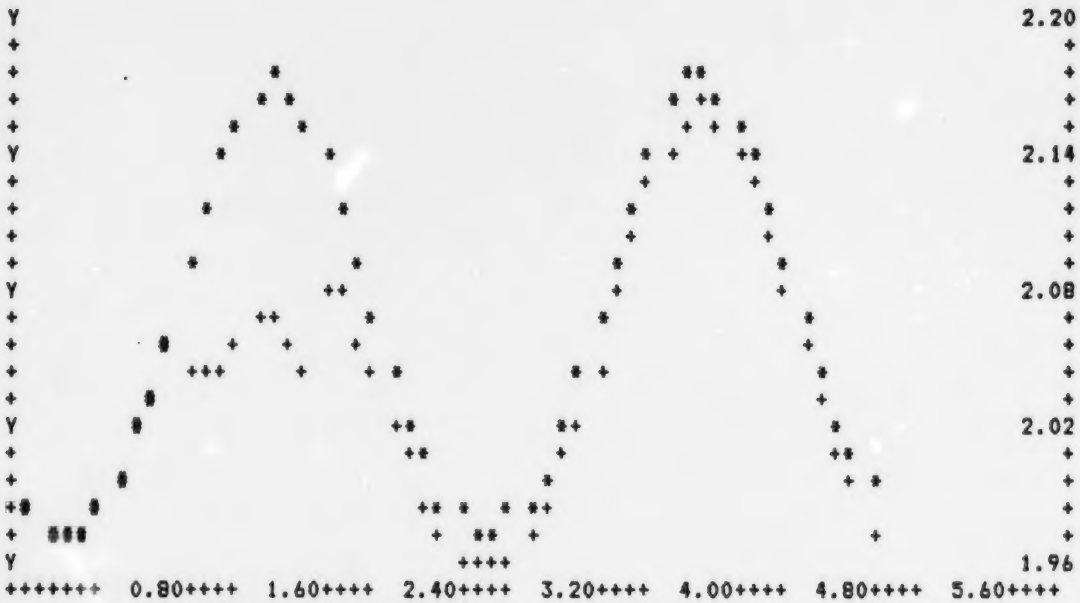
Renter-type Housing



0.100E+01<= X <= 0.500E+02 vs -0.824E-01<= Y <= 0.836E-01

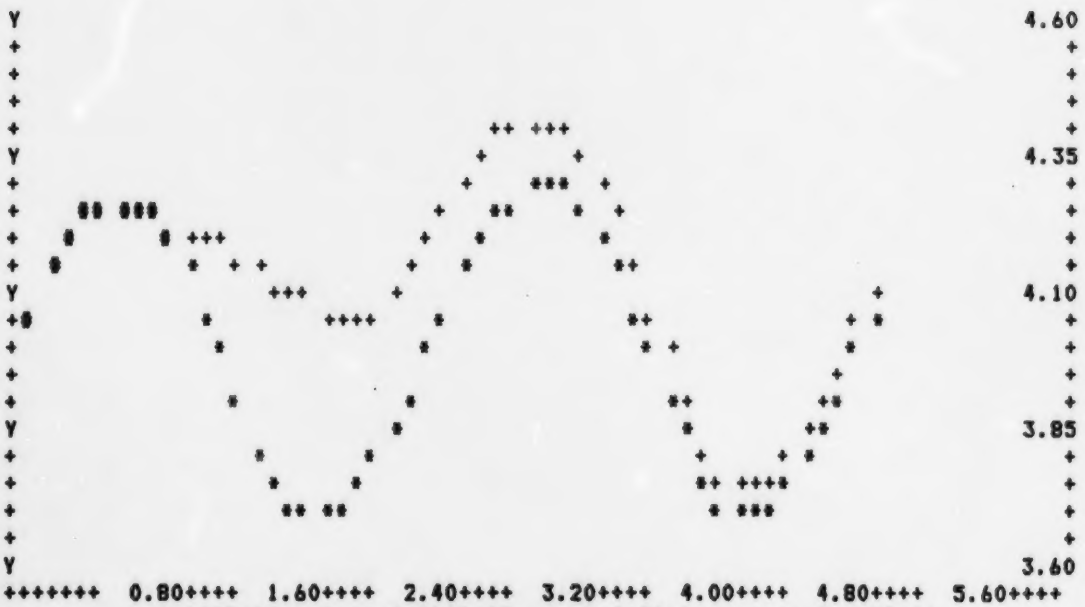
ETHOS Plot 2: Vacancy Rate
Legend: phi = + phi* = * coincident = #

Owner-type Housing



0.100E+01<= X <= 0.500E+02 vs 0.196E-01<= Y <= 0.217E-01

Renter-type Housing



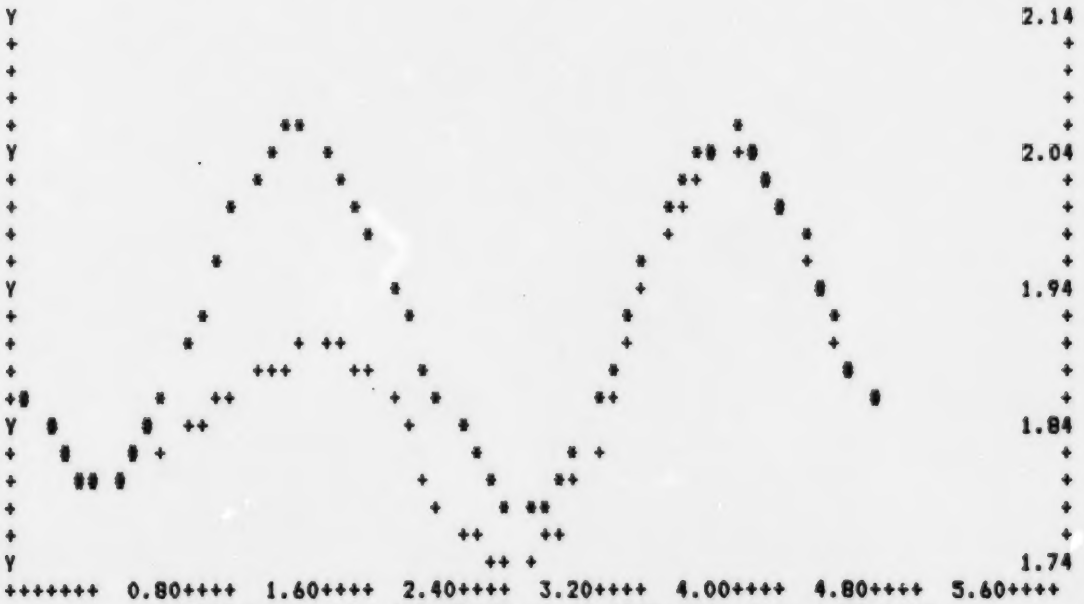
0.100E+01<= X <= 0.500E+02 vs 0.368E-01<= Y <= 0.442E-01

ETHOS Plot 3: Number of Housing Starts
Legend: S = + S* = * coincident = #

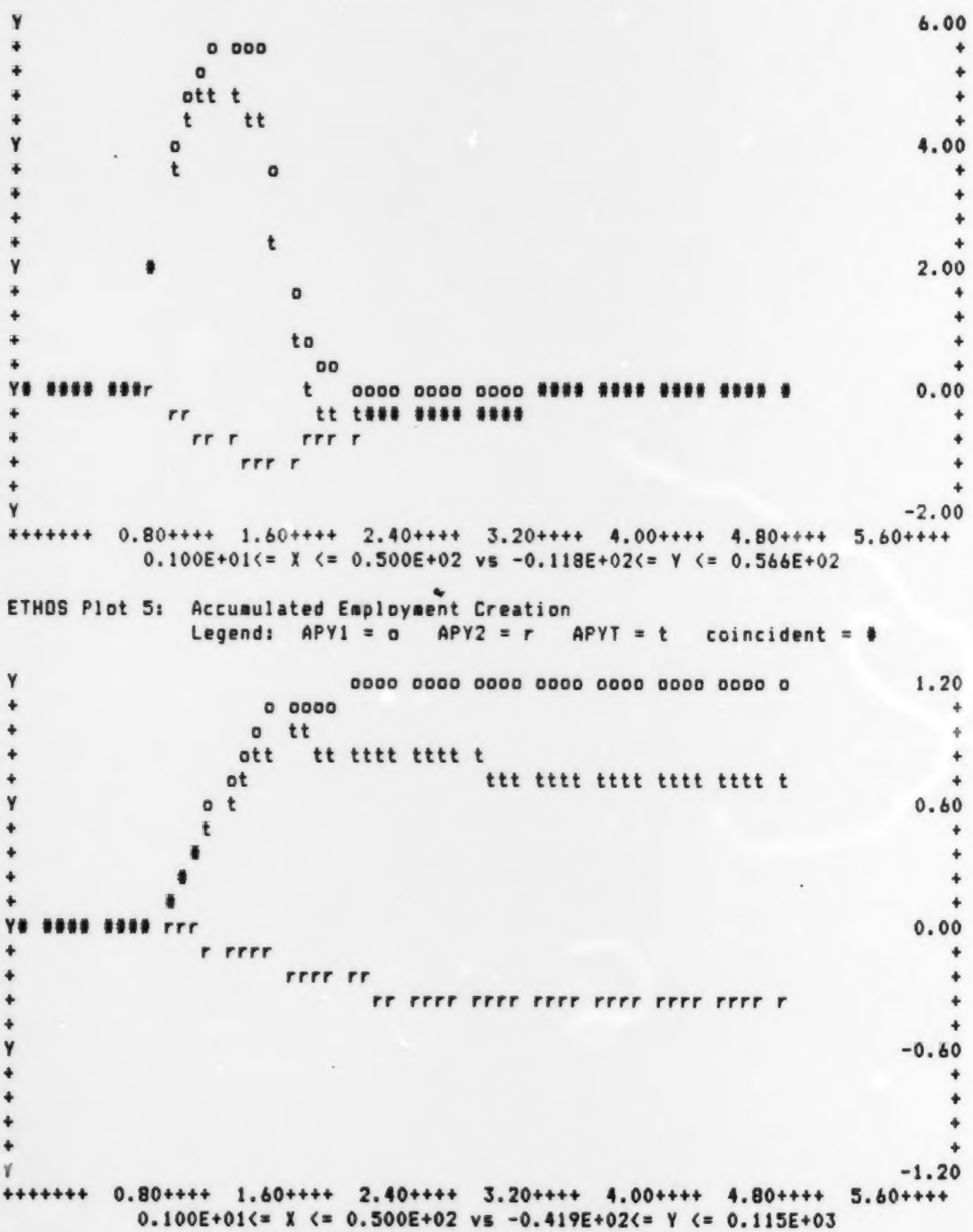
Owner-type Housing

0.100E+01<= X <= 0.500E+02 vs 0.191E+02<= Y <= 0.313E+02

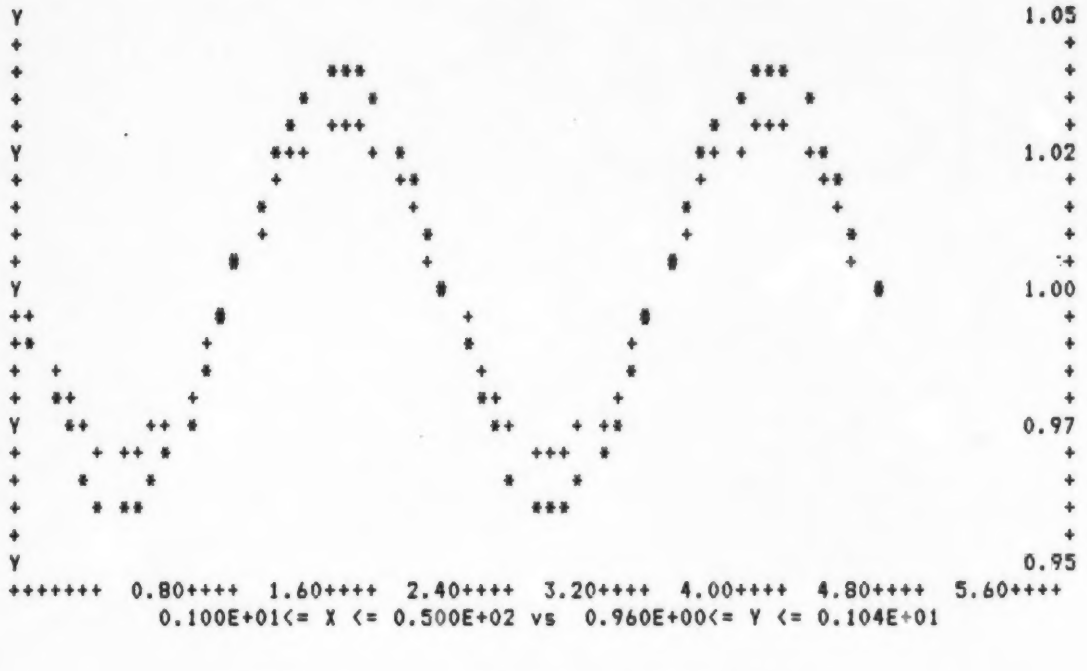
Renter-type Housing

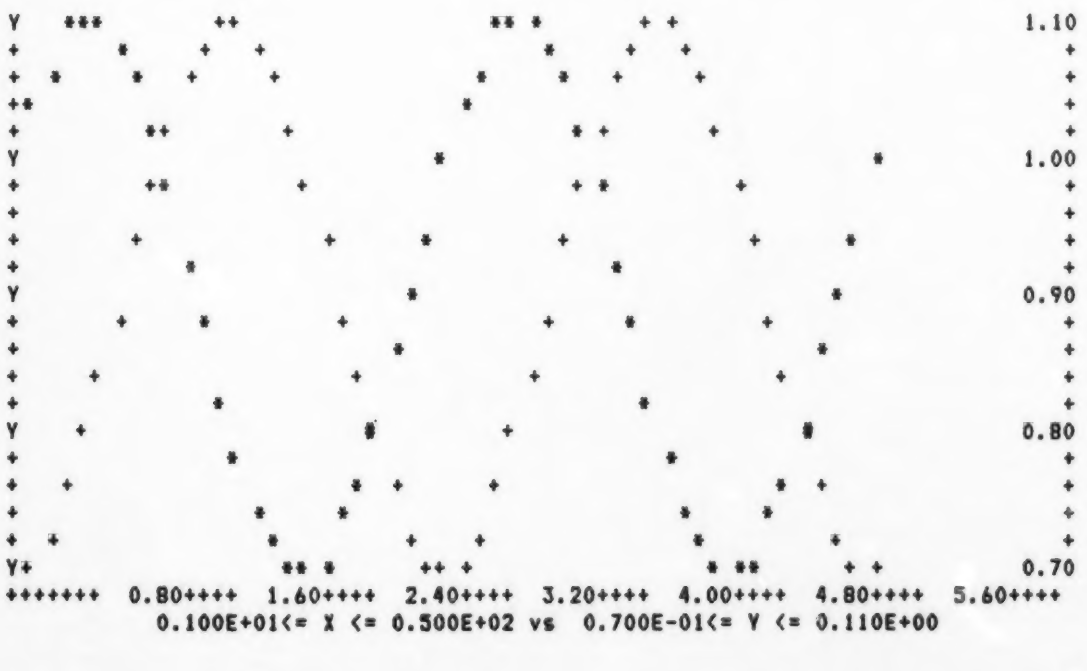


0.100E+01<= X <= 0.500E+02 vs 0.174E+02<= Y <= 0.206E+02


ETHOS Plot 4: Employment Creation
Legend: delE1 = o delE2 = r delET = t coincident = #
6.00
4.00
2.00
0.00
-2.00
0.80++++ 1.60++++ 2.40++++ 3.20++++ 4.00++++ 4.80++++ 5.60++++
0.100E+01<= X <= 0.500E+02 vs -0.118E+02<= Y <= 0.566E+02
ETHOS Plot 5: Accumulated Employment Creation
Legend: APY1 = o APY2 = r APYT = t coincident = #
1.20
0.60
0.00
-0.60
-1.20
0.80++++ 1.60++++ 2.40++++ 3.20++++ 4.00++++ 4.80++++ 5.60++++
0.100E+01<= X <= 0.500E+02 vs -0.419E+02<= Y <= 0.115E+03

ETHOS Plot 6: Exogenous Time Series





APPENDIX C

ETHOS Table 11: Number of Starts With and Without Program (adjusted)
Program: STANDARD DATE: 1988-10-13

Quarter	Owner-type Housing			
	S	S*	S-S*	A(S-S*)
1	31.1	31.1	0.0	0.0
2	31.1	31.1	0.0	0.0
3	30.8	30.8	0.0	0.0
4	30.2	30.2	0.0	0.0
5	29.4	29.4	0.0	0.0
6	28.2	28.2	0.0	0.0
7	26.9	26.9	0.0	0.0
8	25.3	25.3	0.0	0.0
9	26.8	23.7	3.0	3.0
10	26.8	22.2	4.6	7.6
11	26.2	20.8	5.4	13.0
12	25.5	19.8	5.8	18.7
13	25.1	19.2	5.9	24.7
14	25.0	19.1	6.0	30.6
15	25.4	19.5	5.9	36.5
16	26.2	20.4	5.8	42.3
17	24.6	21.7	2.9	45.2
18	24.6	23.2	1.5	46.7
19	25.5	24.7	0.7	47.4
20	26.3	26.3	0.0	47.5
21	26.1	27.7	-1.7	45.8
22	25.9	28.9	-3.1	42.7
23	25.7	29.9	-4.2	38.6
24	25.7	30.6	-5.0	33.6
25	25.6	31.1	-5.5	28.1
26	25.6	31.3	-5.7	22.4
27	25.6	31.2	-5.6	16.8
28	25.6	30.9	-5.2	11.6
29	25.7	30.3	-4.6	7.0
30	25.7	29.4	-3.6	3.3
31	25.8	28.2	-2.4	0.9
32	25.9	26.9	-0.9	0.0
33	25.3	25.3	0.0	0.0
34	23.7	23.7	0.0	0.0
35	22.2	22.2	0.0	0.0
36	20.8	20.8	0.0	0.0
37	19.8	19.8	0.0	0.0
38	19.2	19.2	0.0	0.0
39	19.1	19.1	0.0	0.0
40	19.5	19.5	0.0	0.0
41	20.4	20.4	0.0	0.0
42	21.7	21.7	0.0	0.0
43	23.2	23.2	0.0	0.0
44	24.7	24.7	0.0	0.0
45	26.3	26.3	0.0	0.0
46	27.7	27.7	0.0	0.0
47	28.9	28.9	0.0	0.0
48	29.9	29.9	0.0	0.0
49	30.6	30.6	0.0	0.0
50	31.1	31.1	0.0	0.0

ETHOS Table 12: Employment Effects Associated with Program (adjusted)
Source of Employment Effects: Owner-type Housing
Program: STANDARD DATE: 1988-10-20

Quarter	Direct		Indirect		Induced		Total	
	delE	APY	delE	APY	delE	APY	delE	APY
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	6.8	1.7	3.8	1.0	9.6	2.4	20.2	5.0
10	13.2	5.0	7.4	2.8	18.6	7.0	39.2	14.8
11	16.4	9.1	9.2	5.1	23.2	12.8	48.9	27.1
12	18.0	13.6	10.1	7.7	25.5	19.2	53.7	40.5
13	18.8	18.3	10.6	10.3	26.5	25.8	55.9	54.4
14	19.0	23.1	10.7	13.0	26.9	32.6	56.6	68.6
15	18.9	27.8	10.7	15.6	26.8	39.3	56.4	82.7
16	18.7	32.5	10.5	18.3	26.4	45.9	55.6	96.6
17	12.1	35.5	6.8	20.0	17.1	50.1	36.0	105.6
18	6.0	37.0	3.4	20.8	8.5	52.3	18.0	110.1
19	3.0	37.8	1.7	21.2	4.3	53.3	9.0	112.3
20	0.8	38.0	0.5	21.3	1.1	53.6	2.4	112.9
21	-3.7	37.0	-2.1	20.8	-5.2	52.3	-10.9	110.2
22	-8.5	34.9	-4.8	19.6	-11.9	49.3	-25.2	103.9
23	-12.3	31.9	-6.9	17.9	-17.3	45.0	-36.5	94.8
24	-15.1	28.1	-8.5	15.8	-21.4	39.6	-45.0	83.5
25	-17.0	23.8	-9.6	13.4	-24.1	33.6	-50.7	70.8
26	-18.0	19.3	-10.1	10.9	-25.4	27.3	-53.6	57.4
27	-18.0	14.8	-10.1	8.3	-25.5	20.9	-53.7	44.0
28	-17.1	10.5	-9.6	5.9	-24.2	14.8	-51.0	31.3
29	-15.3	6.7	-8.6	3.8	-21.6	9.4	-45.5	19.9
30	-12.5	3.5	-7.1	2.0	-17.7	5.0	-37.3	10.6
31	-8.9	1.3	-5.0	0.7	-12.5	1.9	-26.4	3.9
32	-4.4	0.2	-2.5	0.1	-6.2	0.3	-13.1	0.7
33	-0.9	0.0	-0.5	0.0	-1.3	0.0	-2.7	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ETHOS Table 13: Additional Summary Calculations
Program: STANDARD DATE: 1988-10-20

Program Cost (by end of program, $millions)

AC = 515.6

Additional Housing Starts Generated by Program
(by end of program, thousands)

Owner-type starts, A(S-S*) = 42.3

Program Participants (by end of program, thousands)

AN = 171.9

Employment created by Program (by end of program, person-years)

Owner-type starts, APY = 96.6

Cost per Additional Housing Start (by end of program, $)

Owner-type starts, AC/A(S-S*) = 12182.

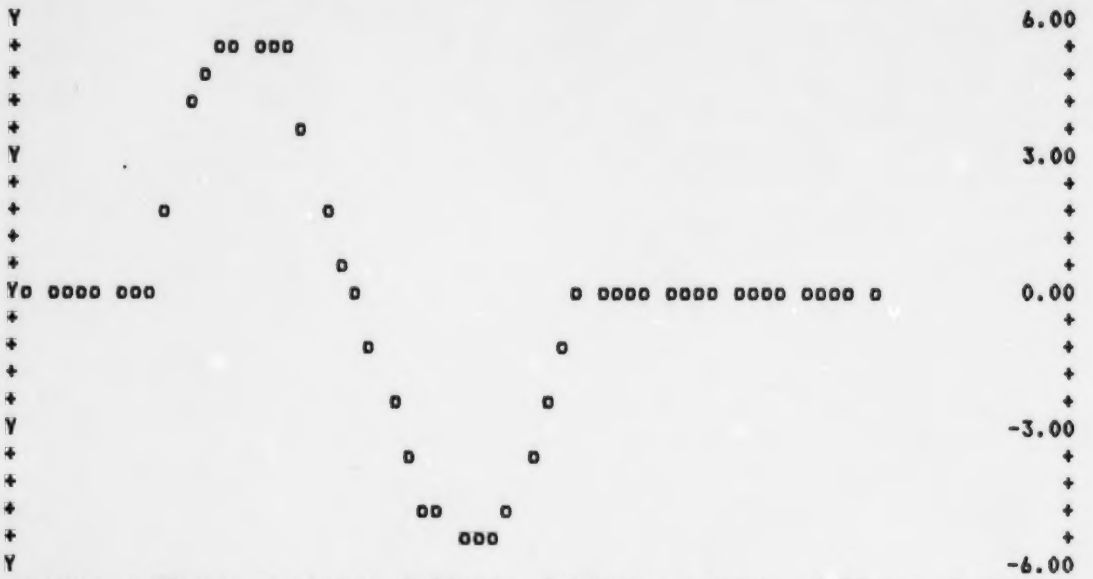
Cost per Person-Year of Employment Created (by end of program, $)

Owner-type starts, AC/APY = 5339.

APPENDIX D

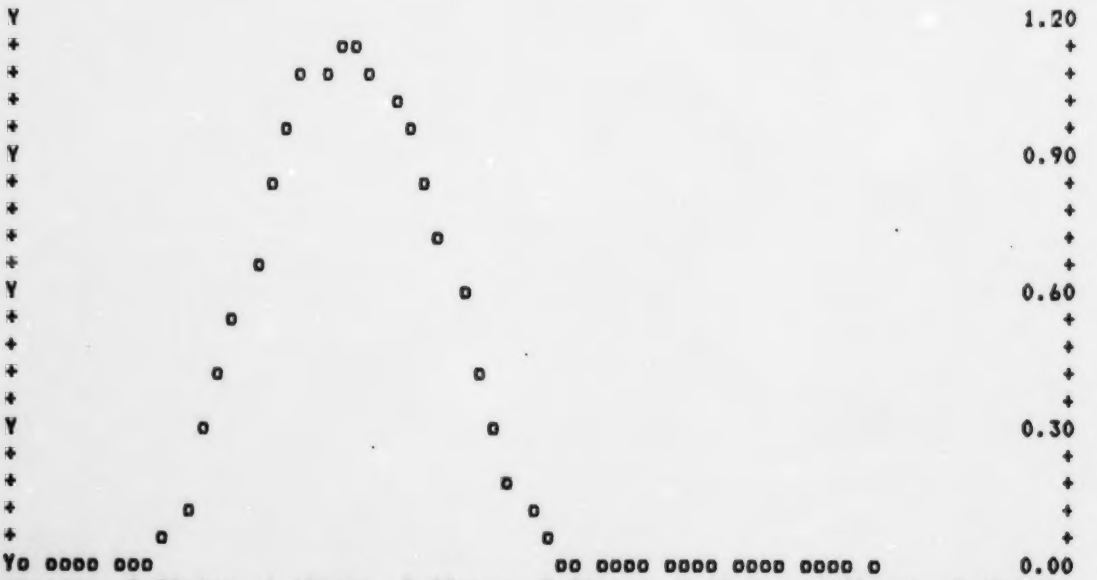
ETHDS, Plot 7: Number of Housing Starts (adjusted)
Legend: S = + S* = * coincident = #

ETHOS.Plot 8: Employment Creation (adjusted)
Legend: delE = o



0.100E+01<= X <= 0.500E+02 vs -0.537E+02<= Y <= 0.566E+02

ETHOS Plot 9: Accumulated Employment Creation (adjusted)
Legend: APY = o



0.100E+01<= X <= 0.500E+02 vs -0.146E-03<= Y <= 0.113E+03